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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/897,843	07/02/2001	Nicolai Kosche	03226.105001; P5810	1070
32615	7590	05/20/2004	EXAMINER	
OSHA & MAY L.L.P./SUN 1221 MCKINNEY, SUITE 2800 HOUSTON, TX 77010			VU, TUAN A	
			ART UNIT	PAPER NUMBER

2124

DATE MAILED: 05/20/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/897,843

Applicant(s)

KOSCHE ET AL.

Examiner

Tuan A Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 02 July 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. This action is responsive to the application filed July 02, 2001.

Claims 1-32 have been submitted for examination.

#### *Claim Rejections - 35 USC § 101*

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1 and 14 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The Federal Circuit has recently applied the practical application test in determining whether the claimed subject matter is statutory under 35 U.S.C. § 101. The practical application test requires that a “useful, concrete, and tangible result” be accomplished. An “abstract idea” when practically applied is eligible for a patent. As a consequence, an invention, which is eligible for patenting under 35 U.S.C. § 101, is in the “useful arts” when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The test for practical application is thus to determine whether the claimed invention produces a “useful, concrete and tangible result”.

As per claim 1, this claim recites a method for improving branch prediction rates comprising processing a case, determining the next case from a sequence; and processing the next case. The very fact of processing a case and the next from some sequence amounts to no specific action particularly leading to a concrete and useful result expected from the method called for above. In other words, the claim does not point out the specifics as to how such processing is being effected in order to improve some branch prediction scheme. Absent any concrete and useful result, the claim fails to requirements of the practical test and amounts to no more than abstract idea, hence leads to a non-statutory subject matter.

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Claim 14 is an apparatus claim corresponding to claim 1 and also fails to list actions of such specificity leading to a concrete and useful result as expected from the prediction rate improving method recited in the preamble of the claim. Because it fails the requirements of the practical application test, the claim amounts to a mere abstract idea and is rejected as non-statutory subject matter.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Wu et al., USPN: 5,655,122 ( hereinafter Wu).

**As per claim 1**, Wu discloses a method for improving branch prediction rates in a microprocessor comprising: processing a case (e.g. *node*, *basic block* – col. 10, Table 2; col. 12, table 3); determining a next case from a sequence involved the processed case (e.g. *do loop*; each successor, each predecessor – col. 12, table 3; col. 14, table 4); and processing the next case (Note: processing each successor or each predecessor reads on processing each case of basic block ).

**As per claim 2**, Wu discloses processing based on probability (e.g. Fig. 10-12)

**As per claim 3**, Wu discloses determining the next case and processing it during processing one initial case ( e.g. col. 12, table 3; col. 14, table 4 --Note: starting from block b

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then for each succeeding  $b_j$  or preceding  $b_i$  node during the loop iteration, check for head or back-edge reads on determining a next case from processing the one case  $b$  )

**As per claim 4**, Wu discloses a sequence from profile information (e.g. *branch frequency* – col. 12, line 63 to col. 13, line 16; *heuristics probabilities* - Fig. 10-12; *ordering the functions* – col. 17, lines 29-37)

**As per claim 5**, Wu discloses determining 2<sup>nd</sup> case from sequence and processing 2<sup>nd</sup> case (e.g. *do loop*; each successor, each predecessor – col. 12, table 3; col. 14, table 4; Fig. 10-12; col. 17, lines 29-37).

**As per claim 6**, Wu discloses processing the next case being selective based on an associated probability (e.g. Fig. 10-11)

**As per claim 7**, Wu discloses determining the next case and processing it occur during the processing of the case (e.g. Fig. 10-12; col. 12, table 3; col. 14, table 4 --Note: starting from block  $b$  then for each succeeding  $b_j$  or preceding  $b_i$  node during the loop iteration, check for head or back-edge reads on determining a next case from processing the one case  $b$ )

**As per claim 8**, Wu discloses that the case and the next case are branch instructions ( e.g.  $b_i \rightarrow b_j$  - col. 12, lines 10-13; table 8 – col. 17)

**As per claim 9**, Wu discloses a method of improving a prediction rate for instructions in code comprising: determining a sequence from profile information (Fig. 9-12); and transforming the code based on the determined sequence (e.g. col. 12, table 3; col. 13, lines 8-16; col. 14, line 29 to col. 15, line 7; Fig. 7,8).

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**As per claim 10**, Wu discloses adding a follow-set ( e.g. Fig. 8; *linked data structures* – col. 13, lines 23-43 – Note: linked data structures reads on follow-set for processing a first instruction).

**As per claim 11**, Wu discloses call graph, i.e. a sequence, and invocation of functions specified via the linked data structures for probability and frequency of execution, hence has implicitly disclosed follow-set being selective based on probability associated of a sequence (col. 13, line 44 to col. 14, line 24).

**As per claim 12**, Wu discloses an apparatus for improving branch prediction rates in a microprocessor comprising:

a compiler with a optimization component (Fig. 2 ),

wherein such component determines a sequence from profile information (e.g. *branch frequency* – col. 12, line 63 to col. 13, line16; *heuristics probabilities* - Fig. 10-12; *ordering the functions* – col. 17, lines 29-37), and

transforms code received by the compiler based on the determined sequence (e.g. Fig. 10-12).

**As per claim 13**, Wu discloses adding a follow-set (. *linked data structures* – col. 13, lines 23-43; Fig. 8).

**As per claim 14**, Wu discloses a software tool for improving branch prediction rates in a microprocessor comprising: a program stored on a computer-readable media for processing the same steps limitations as recited in claim 1. Hence, this claim is rejected with the corresponding rejection as set forth in claim 1.

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**As per claim 15**, this claim corresponds to claim 6, hence is rejected with the corresponding rejection as set forth therein.

**As per claims 16-21**, refer to claims 3-8, respectively.

**As per claim 22**, Wu discloses a software tool for improving a prediction rate for instructions in code comprising a computer-readable stored program for performing the same step limitations as recited in claim 12. Hence, this claim is rejected with the corresponding rejection as set forth in claim 12.

**As per claims 23-24**, these claims correspond to claims 10-11, respectively; and are rejected using the corresponding rejections set forth therein.

**As per claim 25**, Wu discloses an apparatus for improving branch prediction rates in a microprocessor comprising: means for determining a sequence (Fig. 7-8, 10-12) and means for transforming code based on the sequence (Fig. 2; col. 16, line 22 to col. 17, line 37).

**As per claim 26**, refer to claim 13.

**As per claim 27**, Wu discloses a method of improving branch prediction rates in a microprocessor comprising:

converting a plurality of unpredictable branches into a set of predictable branches by expanding at least one of the unpredictable branches into a follow-set branch (e.g. Fig. 3; col. 15-17, tables 5-8 – Note: obtaining probability and frequency information reads on converting hard to predict branch instruction into more predictable instructions; and a follow-set is a set of instructions block following a determination using profile information B2--4-5 in Fig. 3 or set b1, b3 in Fig. 5B) based on a profile ( e.g. Fig. 3, 5; Fig. 10-12) for the unpredictable branches.

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**As per claim 28**, Wu discloses a method for improving branch prediction rates in a microprocessor comprising: determining a sequence involving a branch from a profile information (Fig. 3; col. 15-17, tables 5-8); processing the branch; determining a next branch in the sequence (Fig. 3; col. 15-17, tables 5-8); and selectively processing the next branch ( e.g. Fig. 5, 10-12) during the processing of the branch based on an associated probability (e.g. Fig. 3; col. 15-17, tables 5-8)

**As per claim 29**, Wu discloses determining a second next branch in the sequence (Fig. 3; col. 15-17, tables 5-8- Note: the determining of a second next branch from previous next branch is implicitly disclosed from processing call graph of functions call or basic blocks); and selectively processing the next branch ( e.g. Fig. 5, 10-12) during the processing of the branch based on an associated probability (e.g. Fig. 3; col. 15-17, tables 5-8).

**As per claim 30**, Wu discloses code transformed to comprise a follow-set for the sequence ( e.g. col. 16, line 65 to col. 18, line 10).

**As per claim 31**, Wu discloses a method of improving processor performance comprising:

transforming a set of branches (*data structure 70* - Fig. 2 –Note: branches of basic blocks prior to applying heuristics probabilities) into a second set of branches ( Fig. 10-12),

wherein the second set of branches comprises the original set of branches (the basic blocks branches with the probabilities information being re-ordered reads on second set of branches comprising original set of branches prior to optimization of step 62, Fig. 2); and



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a sequence of branches likely to execute as an entity (e.g. Fig. 5B, 6, 12A – Note: the path taken after a starting head of a tree is chosen is equivalent to a sequence of branches executing as an entity).

**As per claim 32**, Wu discloses processor with means for processing instructions ( e.g. Fig. 2-4) and for performing the steps as recited in claim 31, all of which having been addressed therein.

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan A Vu whose telephone number is (703)305-7207. The examiner can normally be reached on 8AM-4:30PM/Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (703)305-9662.

**Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks

Washington, D.C. 20231

**or faxed to:**

(703) 872-9306 ( for formal communications intended for entry)

**or:** (703) 746-8734 ( for informal or draft communications, please consult Examiner before using this number)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA. , 22202. 4<sup>th</sup> Floor( Receptionist).

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

VAT  
April 15, 2004

A handwritten signature in black ink, appearing to read 'TODD INGBERG', with a long, sweeping line extending from the end of the signature towards the top right of the page.

**TODD INGBERG**  
**PRIMARY EXAMINER**